SPECT/CT in knee pain

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Bone Scintigraphy
- Tc-99m methylene diphosphonate (MDP)
- Sensitivity
- Detect bone abnormalities early
  - Functional changes may manifest before morphological changes
- Available; affordable

Bone Scintigraphy
- Survey entire skeleton
  - solitary vs multiple
  - pattern of distribution
  - characterisation

Bone Scintigraphy
- Assess vascularity
  - 3-phase bone scan
  - Blood flow, blood pool, delayed
Good correlation between three-phase BS and histopathology for the assessment of treatment response of osteosarcoma

- Accuracy of 88% for three-phase BS and 74% for static BS
Bone Scintigraphy

- Reflex sympathetic dystrophy / complex regional pain syndrome

Limitations

- Specificity
  - Osteoblastic activity, bone turnover
- Characterisation
- Localisation
- Soft tissues

What does SPECT/CT add to bone scintigraphy?
SPECT
- Cross-sectional imaging
- Multiplanar reconstruction
- Contrast resolution
- Soft tissues: meniscus, cruciate ligament, collateral ligament

SPECT/CT
- Combines functional and anatomical imaging
- Hybrid imaging
  - Accurate co-registration of sequential SPECT and CT
  - Complementary; incremental value

SPECT/CT
- Detection
- Localisation
  - bone, joint, soft tissue
- Characterisation
- Soft tissues
- Anatomical abnormalities

SPECT/CT
- Sensitivity
- Specificity
- Accuracy
- Diagnostic confidence
SPECT/CT

- Limitations
  - Higher radiation burden
  - Cost
  - Longer examination time
  - Availability

How much incremental value does SPECT/CT add to bone scintigraphy?

SPECT/CT in knee pain

- Assess incremental value of SPECT/CT
- Compared two-phase bone scintigraphy, SPECT and SPECT/CT
- 39 patients, 65 knees, 105 lesions

SPECT/CT in knee pain

- Two-phase bone scan vs SPECT vs SPECT/CT
- Detection
- Localisation
- Characterisation
- Lesion-based, patient-based, knee-based analyses
SPECT/CT in knee pain

**Bones and joints**
- Osteoarthritis - 45
- Psoriatic arthropathy - 4
- Synovial inflammation - 1
- Osteonecrosis - 8
- Osteochondral abnormality - 8
- Loose body - 1
- Meniscus injury - 1
- Osteoid osteoma - 2
- Benign bone lesion - 4
- Malignant bone tumor - 4

**Soft tissues**
- Soft tissue infection with sinus - 1
- Prepatellar bursitis - 2
- Quadriceps tendinosis - 1

**Detection of lesions**

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<tr>
<th>Lesion-based analysis</th>
<th>Patient-based analysis</th>
<th>Knee-based analysis</th>
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<tr>
<td>BS</td>
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**Characterisation of lesions**
- Patella malalignment - 9
- Bipartite patella - 1
- Loosening of knee prosthesis - 2
- Bony remodeling - 4
- Fracture - 2
- Shin splint - 2
- Bone infection - 3

**SPECT/CT in knee pain**
- Diagnose lesions causing, contributing to or associated with osteoarthritis
  - Patellar malalignment and maltracking
  - Bipartite patella
  - Osteochondral lesion
  - Loose bodies
- More specific treatment
- Prognosis
SPECT/CT in knee pain

- Value of CT
- Anatomical abnormalities
  - Patellar malalignment and maltracking
  - Bipartite patella with pseudoarthrosis
  - Osteochondral lesion
  - Loose bodies
  - Osteonecrosis
  - Osteoid osteoma

A 38-year-old man with left knee pain.

Bipartite patella

A 33-year-old woman with bilateral knee pain.

Patellar maltracking

A 65-year-old man with bilateral knee pain.

Avascular necrosis
A 33-year-old woman with right knee pain.

**Quadriceps tendinosis**

**SPECT/CT in post-surgical knee**

- Distorted anatomy; indwelling prosthesis
- SPECT/CT
  - Evaluating post-surgical knee pain
  - Guiding subsequent management

**Conclusion**

- Addition of SPECT/CT to bone scintigraphy
  - Incremental value
  - Diagnostic confidence
- Problem solving tool when MRI inconclusive
- Complementary role

**Conclusion**

- Alternative when MRI is not feasible/available
  - Contraindications to MRI: claustrophobia, severe obesity, non-MRI compatible implants/aneurysmal clips/pacemakers
- Post-surgical knee
  - Artefacts from implants in MRI
Thank you